CROSS-REFERENCE TO RELATED APPLICATIONS

6-7-06 MB

This application is a continuation-in-part of United States Patent Application Serial No. 10/407,916, filed on April 4, 2003 and entitled "Hybrid Battery Power Source For Implantable Medical Use," now USPN 7,020,519, which is a continuation-in-part of United States Patent Application Serial No. 10/350,921, filed on January 24, 2003 and entitled "Hybrid Battery Power Source For Implantable Medical Use." now USPN 6,909,915

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to improvements in the performance of implantable defibrillators, implantable cardioverter-defibrillators (ICDs) and other battery powered medical devices designed to provide high energy electrical stimulation of body tissue for therapeutic purposes.

2. Description of Prior Art

High energy battery powered medical devices, such as implantable defibrillators and ICDs, are designed to produce a strong electrical shock to the heart when called upon to correct the onset of tachyarrhythmia. The shock is produced by one or more energy storage capacitors that have been charged to a high voltage by the device's battery power source. The power source is typically a lithium/silver vanadium oxide (Li/SVO) battery or cell of the type disclosed in U.S Patent No. 5,458,997 of Crespi, and references cited therein. Crespi notes that the Li/SVO chemistry is useful for defibrillation applications because of its ability to produce pulses of energy that can charge the high voltage capacitors within the short time frame required by the device. In particular, the Li/SVO battery is typically called upon to charge the capacitors to deliver within 10 seconds or less a shock of up to 40 Joules. This must be done several times in succession if additional shocks are required. Unfortunately, as noted by Crespi, a Li/SVO cell can experience unpredictable resistance increase upon long-term discharge service. In particular, Li/SVO cells commonly have a two-stage run down with slightly different voltage plateaus at each stage. It is at the interval between the two plateaus where it is common to see the resistance increase described by Crespi. The problem is further explained in U.S. Patent No. 6,426,628 of Palm et al. as being a transient phenomenon that occurs following a period of low current draw. When a load is reapplied (e.g., a defibrillation pulse is required), the resistance build-up temporarily prevents the cell